

CLAIMS

What is claimed is:

1. An apparatus for inspecting a disc-like substrate comprising a holding structure having members arranged to hold and rotate the substrate about a first axis, the holding structure being coupled to a rotatable member, the rotatable member configured to rotate the holding structure about a second axis different from the first axis.
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- 10 2. The apparatus, as set forth in claim 1, wherein the members comprise a plurality of wedge assemblies configured to rotate the substrate about the first axis.
- 15 3. The apparatus, as set forth in claim 1, wherein the first axis is disposed generally perpendicular to a flat surface of the substrate and extends generally through an axial center of the substrate.
- 20 4. The apparatus, as set forth in claim 1, wherein the holding structure comprises two L-shaped gripping arms arranged to form a single U-shaped structure and configured to hold the substrate substantially parallel to the gripping arms.

5. The apparatus, as set forth in claim 4, wherein the U-shaped structure is configured to open and close about the perimeter of the substrate.

5 6. The apparatus, as set forth in claim 5, further comprising tensioning springs configured to permit the U-shaped structure to open and close about the perimeter of the substrate.

10 7. The apparatus, as set forth in claim 2, wherein the holding structure comprises three wedge assemblies, at least one wedge assembly coupled to a motor and configured to rotate the substrate about the first axis disposed generally perpendicular to a flat surface of the substrate and extending generally through an axial center of the substrate.

15 8. A method of inspecting a semiconductor wafer comprising the acts of:

(a) loading the substrate into a holding structure, the substrate having a first surface and a second surface;

20 (b) inspecting the first surface of the substrate by rotating the substrate within the holding structure about a first axis, the first axis disposed

generally perpendicular to the surface of the substrate and extending generally through the axial center of the substrate;

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- (c) rotating the holding structure about a rotatable member to rotate the substrate approximately 180° about a second axis, the rotatable member being mechanically coupled to the holding structure;

- (d) inspecting the second surface of the substrate; and

- 10 (e) removing the substrate from the holding structure.

9. The method as set forth in claim 8, wherein act (a) further comprises the acts

of:

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- (a) opening gripper arms of the holding structure;

- (b) inserting the substrate into a wedge assembly on the gripper arms;

20 (c) retracting the wedge assembly; and

- (d) closing the gripper arms.

10. The method, as set forth in claim 8, wherein act (b) comprises the act of rotating the substrate within the holding structure until a notch on the first surface of the substrate is optically sensed.

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11. The method, as set forth in claim 8 wherein act (b) comprises the act of rotating the substrate within the holding structure by using a drive wheel wedge assembly mechanically coupled to a rotational drive motor, the drive wheel wedge assembly being coupled to the substrate.

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12. The method, as set forth in claim 11, comprising controlling the rotation of the substrate by using an operator driven mechanism coupled to control the rotational drive motor.

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13. The method, as set forth in claim 8, wherein act (c) comprises the act of rotating the holding structure about a rotatable member by using a pitch motor, the pitch motor being operably coupled to the rotatable member.

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14. The method, as set forth in claim 13, comprising controlling the rotation of the substrate by using an operator driven mechanism coupled to control the pitch motor.

15. A method of fabricating an integrated circuit package comprising the acts of:

(a) disposing a plurality of integrated circuit devices onto a silicon wafer;

5 (b) inspecting the wafer by:

(1) loading the wafer into a wafer holding structure, the wafer having
a first surface and a second surface;

10 (2) inspecting the first surface of the wafer by rotating the wafer
within the wafer holding structure about a first axis, the first
axis disposed generally perpendicular to the surface of the
wafer and extending generally through the axial center of the
wafer;

15 (3) rotating the wafer holding structure about a rotatable member to
rotate the wafer approximately 180° about a second axis, the
rotatable member being mechanically coupled to the wafer
holding structure;

20 (4) inspecting the second surface of the wafer; and

(5) removing the wafer from the wafer holding structure.

(c) electrically testing the integrated circuit devices;

(d) singulating the integrated circuit devices; and

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(e) packaging selected singulated integrated circuit devices to form
respective integrated circuit packages.

10 16. The method as set forth in claim 15, wherein act (b)(1) comprises the acts of:

(a) opening gripper arms of the wafer holding structure;

(b) inserting the wafer into a wedge assembly on the gripper arms;

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(c) retracting the wedge assembly; and

(d) closing the gripper arms.

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17. The method, as set forth in claim 15, wherein act (b)(2) comprises the act of
rotating the wafer within the wafer holding structure until a notch on the first surface of the
wafer is optically sensed.

18. The method, as set forth in claim 15, wherein act (b)(2) comprises the act of rotating the wafer within the wafer holding structure by using a wedge assembly mechanically coupled to a drive motor, the wedge assembly being coupled to the wafer.

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19. The method, as set forth in claim 18, comprising controlling the rotation of the wafer by using an operator driven joystick coupled to control the drive motor.

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10 20. The method, as set forth in claim 15, wherein act (b)(3) comprises the act of rotating the wafer holding structure about a rotatable member by using a pitch motor, the pitch motor being operably coupled to the rotatable member.

15 21. The method, as set forth in claim 20, comprising controlling the rotation of the wafer by using an operator driven joystick coupled to control the pitch motor.